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Shaughnessey Number

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by Elizabeth E. Zucker

EEB Chemical Profile

Naled

100 Fish and Wildlife Toxicology

100.1 Minimum Requirements

100.1.1 Avian Acute Oral LD50

Species	Test Material	LD50 (95% C.L.)	Category	Reference
Mallard	93%	52.2 mg/kg (37.8-72.3)	Core	Tucker & Crabtree (1970)
Canada Goose	93%	36.9 mg/kg (27.2-50.0)	Suppl.	Tucker & Crabtree (1970)
Sharp-tailed ~~Goose~~ Grouse	93%	64.9 mg/kg (37.3-111)	Suppl.	Tucker & Crabtree (1970)

100.1.2 Avian Dietary LC50

Species	Test Material	LD50 (95% C.L.)	Category	Reference
Mallard Duck	Technical	2724 ppm (1068-15089)	Core	Hill et al. (1975)
Bobwhite Quail	Technical	2117 ppm (1502-2890)	Core	Hill et al. (1975)
Ring-necked Pheasant	Technical	2538 ppm (2221-2896)	Core	Hill et al. (1975)
Japanese Quail	Technical	1327 ppm (1178-1490)	Suppl.	Hill et al. (1975)

100.1.3 Fish Acute LC50

The following data were taken from Johnson and Finley (1980). All tests were performed using the 90% technical material.

Species	96-h LC50 (95% CL) in ppb.
Rainbow Trout	195 (126-302)
Cutthrout Trout	127 (115-139)
Lake Trout	87 (53-142)
Bluegill[1]	2200[2]
Channel catfish	710
Fathead Minnow	3300
Largemouth Bass[1]	1900

[1] Tested in hard water (162-272 ppm $CaCO_3$)
Naled was twice as toxic to rainbow trout at 13° C as at 2°C. Toxicity was not affected by variation in hardness.

[2] This same study has been reported to have a 96 hr. LC_{50} of 1,800ppb in "Effects of Pesticides on Fish and Wildlife". USFWS Circular 226 Aug. 1965

Species	Test Material	Results[3]	Category	Reference
Rainbow Trout	Tech.	1.6°C 340(310-370) ppb 7.2°C 220(200-230) ppb 12.7°C 160(150-170) ppb	Core	Macek et al. (1969)

Formulations

Species	Test Material	Results	Category	Reference
Rainbow trout	Naled 58% Xylene 20% (Dibrom 8)	96 hr. LC_{50} = 215 ppb (185-250)	Core	EPA (1977)
Bluegill sunfish	Naled 58% Xylene 20% (Dibrom 8)	96 hr. LC_{50} = 1.2 ppm (1.02-1.42)	Core	EPA (1971)
Atlantic salmon	Naled (Dibrom 14)	24 hr. LC_{50} 165 ppb for both feeding fry and fingerlings	Suppl.	Dean et al. (1977)

100.1.4 Aquatic Invertebrate LC50

The following data were taken from Johnson and Finley (1980). All tests were performed using the 90% technical material.

Species	Life Stage	Results (95% CI)
Daphnia pulex	1st instar	48 hr EC_{50} = 0.4 ppb (0.2-0.8)
Simocephalus serrulatis	1st instar	48 hr EC_{50} = 1.1 ppb (1.0-1.2)
Sowbug (Asellus brevicandus	Mature	96 hr LC_{50} = 41 ppb
Scud (Gammaris fasciatus	Mature	96 hr LC_{50} = 18 ppb (16-20)
Glass shrimp Palaemonetes kadiakensis	Mature	96 hr LC_{50} = 92 ppb
Pteronarcys californica	2nd year	96 hr LC_{50} = 8 ppb (6-11)

Species	Test Material	Results (95% CL)	Category	Reference
Daphnia magna	91.6%	48 hr LC_{50} - 0.3 ppb (0.2-0.4)	Core	Wheeler (1978)
Gammarus lacustris	97.0%	96 hr LC_{50} = 110 ppb (80-155)	Suppl.	Sanders (1969)

Formulations

Species	Test Material	Results (95% CL)	Category	Reference
Daphnia magna	Naled 85% (Dibrom 14C)	48 hr LC_{50} = 0.5 ppb (0.3-0.7)	Suppl.	Wheeler (1978)

100.2 Additional Terrestrial Laboratory Tests

100.2.1 Toxicity studies on beneficial insects with naled.

Species	Formulation	Results	Reference
Honey bee (*Apis mellifera*)	Technical	LD_{50} = 0.4800 micrograms per bee (highly toxic)	Atkins *et al.* (1975)
Honey bee	Technical	solutions of 0.1% to 1.0% caused 79-100% mortality (highly toxic)	Harris & Svec (1969)
Honey bee Alkali bee (*Nomia melanderi* Leafcutter bee (*Meganchile rotundata*)	4 lb. E	At 1 lb. AI/A, 1-hr. residues highly toxic to all species. One day residues rel. non-toxic to all species.	Johansen & Eves (1965)
Honey bee Alkali bee Leafcutter bee	8 lb. EC	At .5 AI/A, 3-hr residues low to mod. in tox. to honey bee (21% mort.) and alkali bee (30% mort.), highly toxic to leafcutter bee (100% mort.)	Johansen (1972)
Honey bee	20% WP, 8 lb/gal EC	Highly toxic residues, but residual toxicity is short-lived.	Johansen (1961)

100.2.2 Toxicity studies on nontarget soil and surface invertebrates with naled.

Species	Formulation	Results	Reference
Eleven species of parasitic wasps and predaceous beetles	8 lb/gal EC	At .50 lb AI/100 gal toxicity ranged from non-toxic, depending on species tested.	Bartlett (1963)
Predaceous mite (*Amblyseius hibisci*)	8 lb/gal EC	At .50 lb/AI/100 gal., highly toxic	Bartlett (1964)
Parasitic wasps (*Aphytis melinus*, *Metaphycus luteolus*) Predaceous beetles (*Lindorus lophanthae*, *Cryptolaemus montrouzieri*	8 lb/gal EC	At 0.0477% Conc. in honey, zero to low tox. to all species. At 0.477% conc. in honey, zero to low tox. to beetles, high tox. to wasps	Bartlett (1966)

Data indicate that toxicity of naled to parasitic wasps and predaceous beetles is highly variable, depending on species tested, concentration of toxicant, etc. In one study, naled tested highly toxic to a predaceous mite.

100.3 Additional Aquatic Laboratory Tests

100.3.1 Estuarine/marine toxicity studies

Species	Test Material	Results	Category	Reference
Oyster larvae (*Crassostrea virginica*)	96.1%	LC_{50} of approx. 3.5 ppm at 45 hrs.	Supple.	Haskin & Haines (1960)
Striped Bass (*Morone saxatilis*)	90%	0.5 mg/l (100-2400)	Supple.	Korn (1974)

100.3.2 Toxicity studies on Reptiles and Amphibians

A 96-hr TL_{50} of 1.7 mg/l was found for one week old frogs (Western Chorus Frog) exposed to technical naled.

100.4 Field Tests

Lesser (1977) confined test organisms in cages within a salt marsh in Maryland. The marsh was treated with 1 oz Dibrom 14 per acre. Forty-eight hours after treatment, negliable mortality was found for oysters, mussels, snails, periwinkles, fiddler crabs, spot and killifish.

Aerial applications of Dibrom 14 at 4 oz and 6 oz/acre to a tidal creek caused no measurable mortality to juvenile blue crabs and killifish held in cages for 1 hour after treatment (Kelly 1969). In a comparable test (Kelly 1970), low mortality (15-25%) was observed among shrimp and crabs exposed to 4 oz and 6 oz of Dibrom 14 per acre.

Goode et al. (1967) examined a salt marsh before and after aerial application of 0.6 oz/A of Dibrom 14 (ULV). The only observed mortality of aquatic organisms was four small blue crabs at the edge of a shallow pool.

According to Dean and Colquhoun (1977), Ephemeroptera biomass and standing crop; Diptera biomass and total biomass and standing crop of beuthic organisms were reduced following a treatment of 1 oz Dibrom 14 concentrate plus 15 oz heavy aromatic naptha (0.1 lbs active/acre).

Note to Reviewer: None of the field studies discussed above are not acceptable for fulfilling guidelines requirement. To gain an indication of the studies' limitations. The DER's should be examined.

101 General Toxicology

The one-liners from Toxicology Branch are appended.

102 Physical and Chemical Properties

102.1 Chemical Name

1,2-Dibromo-2,2-dichloroethyl dimethyl phosphate

102.2 Structural Formula

102.3 Common Name

Naled

102.4 Trade Name

Dibrom, Bromex

102.5 Molecular Weight

381

102.6 Physical State

White, crystalline solid

102.7 Properties

From EEB Review: Out 6/21/83

102.7.1 Solubility (from 1972 Lab Report unfound)

Water	< 5000 ppm
Xylene	completely miscible
Hexane	<8.0%

103 Behavior in the Environment

Information taken from EAB Task 3: August 10, 1982

103.1 Soil

Naled (formulation unspecified), at 10 ppm, rapidly degraded with half-lives of 1.4-4.0 hours in soils ranging in texture from sand to silt and incubated at 80% field capacity and room temperature. The degradate dichlorvos was found at a maximum concentration of 10% of applied naled within 24 hours after treatment. Dichlorvos (10 ppm) also rapidly degraded in the test soils, with half-lives of 2.3-8.0 hours.

Radiolabeled naled exhibited low to intermediate mobility in soils ranging in texture from loamy sand to clay based on soil thin-layer chromatography tests. Dichlorvos was intermediately mobile to mobile in the same soils. Mobility of both compounds may be related to soil organic matter content.

103.2 Water

Naled (100 ug/ml) degraded rapidly in aqueous solutions buffered at pH 5.0, 7.0, and 9.0. Half-lives at 21°C ranged from 0.25 to 25 hours, whereas those at 37°C ranged from 0.05 to 6 hours. Naled (100 ug/ml) also degraded rapidly in sewage water samples (pH 7.0) incubated at room temperature, with a half-life of 23 hours; dichlorvos (3 ug/ml) was also detected.

Dissipation of naled (Skychoda, 34.9% ai, formulaton unspecified) in sewage water was rapid following addition of 5 ppm to a trickling filter in a sewage treatment plant. A maximum of 0.04 ppm was detected 20 minutes after treatment, but after 24 hours, no naled was detected (<0.015 ppm). The breakdown products dichlorvos and dichloroacetaldehyde were detected at maximum concentrations of 0.4 and 0.04 ppm, respectively, 20 minutes after treatment, but neither compound was found in samples taken 24 hours after treatment.

103.3 Animal

Naled did not accumulate in whole body tissues of killifish (Fundulus heteroclitus exposed to naled (Dibrom 14 EC, 85% ai) at 0.031, 0.063 and 0.127 ppm in static bioassay tests (sea water: pH 7.3 to 7.5; dissolved oxygen content 6.6 to 7.8 mg/l; daily temperature range 10-17°C). Naled was not detected (<0.02 ppm) in any fish tissue samples taken over the 7-day test period. The degradate dichlorvos was found at a maximum concentration of 0.04 ppm, approximately twice the concentration in corresponding water samples, 1 hour after treatment, but was not found (<0.01 ppm) in tissue samples taken after 24 hours. Naled half-life in water samples was <24 hours. Dichlorvos was found in all water samples, at a maximum concentration of 0.02 ppm after 24 hours, but <0.01 ppm was found in samples taken at the end of the test period.

103.4 Microorganisms

Naled, at 2 ppm had little or no effect on the respiration of Azotobacter vinelandii; however, at 100 ppm, respiration was inhibited 90%. Dichlorvos (DDVP), at 2 and 100 ppm, inhibited respiration by 29 and 57%, respectively.

Summary

"Naled and its degradate dichlorvos dissipate rapidly in aerobic soils with half-lives of ≤8 hours. Naled exhibits low to intermediate mobility in soils, whereas, dichlorvos is intermediately mobile to mobile. Mobility appears to be related to soil organic matter content. Naled degrades rapidly in aqueous solution (half-life <25 hours), with rates increasing at higher temperatures and pHs. Naled also rapidly degrades in sewage water (half-life <24 hours) to dichlorvos and dichloroacetaldehyde. Neither naled nor dichlorvos accumulate in fish tissues. In conclusion, naled does not appear to represent an environmental hazard based on the aforementioned data which indicate very rapid degradation and extremely low bioaccumulation potential."